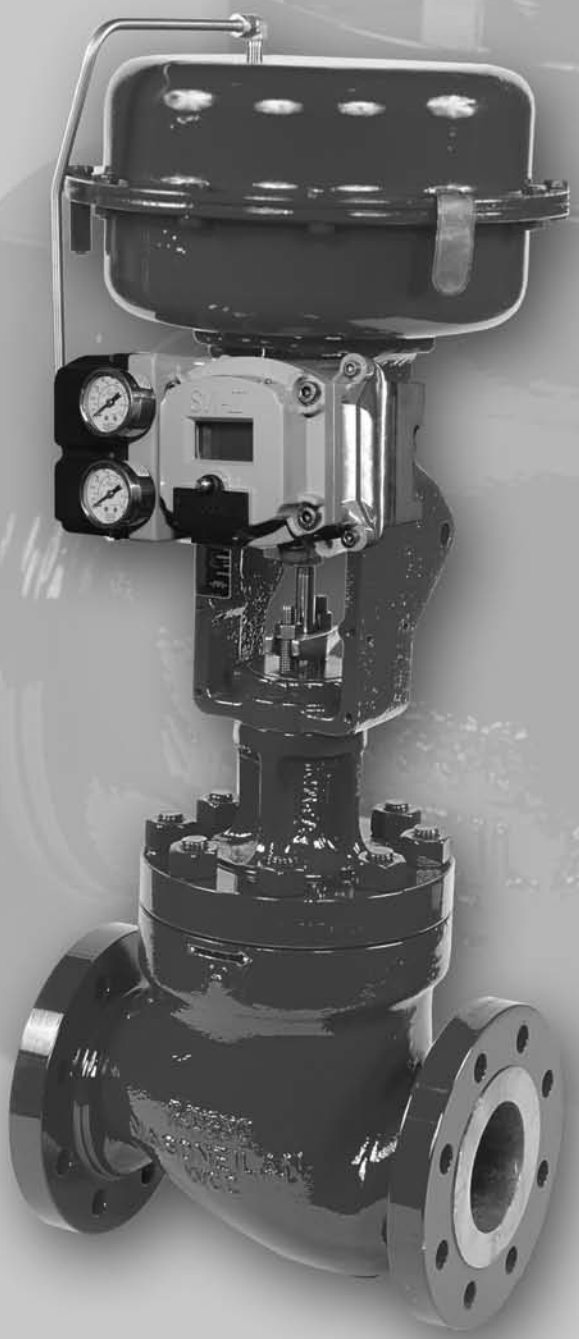
DRESSER Masoneilan

Instructions
EH41005
07/02

41005 Series
Control Valves



Complete Line of Heavy Duty, Balanced, Cage Guided, Globe Valves with Lo-dB®/Anti-Cavitation Capabilities

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FIGURE OF BODY SUB ASSEMBLY 13-14
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MASONEILAN DIRECT SALES OFFICES .....BACK COVER

IMPORTANT

This document contains all the instructions required for the installation, operation and maintenance of the equipment. Regular maintenance, strict observance of these instructions and the use of manufacturer's replacement parts will guarantee optimum operation and reduce maintenance costs.

1. General

1.1. Scope

The following instructions are designed to guide the user through the installation and maintenance of the 41005 series cage-guided valves for all sizes and pressure classes.

This instruction manual describes all the standard options in the 41005 valve series. Special supplements or addendums to this instruction manual may be required for special designs developed to meet specific customer requirements.

1.2. Serial plate

The serial plate is usually fixed to the side of the actuator yoke. It indicates, amongst other things, the size and type of valve, the pressure class, the body and bonnet material, and the maximum supply pressure of the actuator.

1.3. After Sales Service

Masoneilan offers After Sales Service comprised of highly qualified technicians to support the operation, maintenance and repair of its equipment. Contact the local Masoneilan representative or Masoneilan factory located closest to you.

1.4. Spare parts

Only Masoneilan replacement parts should be used when carrying out maintenance operations. Obtain replacement parts through our local representatives or Spare Parts Department.

When ordering spare parts, the model and serial numbers indicated on the manufacturer's serial plate must be given.

The recommended spare parts are indicated in the parts list included in this instruction manual.

1.5. Actuator and accessories

The valve is typically equipped with an actuator. Actuators and other valves accessories have their own instruction manuals, which provides information on the electric and pneumatic connections. The instruction manuals to be used for standard actuators are ER3000 for type 37/38 and ER8788 for type 87/88.

2. Numbering System

1st	2nd		1st	2nd	3rd	4th	5th	6th
		–	4	1	0	0	5	

Actuator Type*

37	Spring Diaphragm : direct, air to close (fail open action)
38	Spring Diaphragm : reverse, air to open (fail to close)
84	Cylinder : spring return, direct, air to close, single or double-acting (fail open action)
85	Cylinder : spring return, reverse, air to open, single or double-acting (fail to close)
86	Cylinder : double-acting, without spring, air to open or air to close action
87	Spring Diaphragm : direct, air to close (fail open action)
88	Spring Diaphragm : reverse, air to open (fail close action)

Body Series

41	Cage Guided, Balanced Globe

Seal Type

0.	Undefined
3.	Pressure Energized PTFE Seal Ring
4.	Auxiliary Shut-off Plug (Pilot)
5.	Metal Seal Ring
6.	PTFE Seal Ring
9.	Graphite Seal Ring

Trim Type/Characteristic

0.	Undefined
1.	Standard Cage/Linear
2.	Standard Cage/Equal %
3.	Lo-dB®/Anti-Cav Single Stage/Linear
4.	Lo-dB/Anti-Cav Single Stage with Diffuser/Linear
5.	Lo-dB Multi-Stage/Linear
6.	VRT (stack) Type S/Linear
7.	VRT (partial stack) Type S/Modified
8.	VRT (cage) Type C/Linear
9.	Anti-Cav Multi-Stage/ Linear

Design Series

5

Optional Config.

A Angle Body

* Refer to applicable product instructions manual for cylinder type actuator.

Engineered trim options are also available for high temperature and high pressure drop applications, including Multi-Stage Anti-Cavitation Trim. Please consult factory for details.

3. Installation

3.1. Piping cleanliness

Before installing the valve in the line, clean piping and valve of all foreign material such as welding chips, scale, oil, grease or dirt. Gasket mating surfaces must be thoroughly cleaned to insure leak-free joints.

3.2. Isolation bypass valve

To allow for in-line inspection, maintenance and removal of the valve without service interruption, provide a manually operated shutoff valve on each side of the control valve and a manually operated throttling valve in the bypass line.

3.3. Heat insulation

In case of a heat-insulated installation, do not insulate the valve bonnet and take protective measures relative to personal safety.

3.4. Hydraulic test and cleaning of lines

During this operation, the control valve must not be used as an isolating valve. This means that the valve must always be opened before carrying out pressure tests in the process line, cleaning of pipes, etc. Otherwise equipment damage or failure of the seal rings could result.

3.5. Flow direction

The valve must be installed so that the process fluid will flow through the valve in the direction indicated by the flow arrow located on the body.

4. Disassembly

4.1 Actuator removal (Figures 16 and 17)

Access to the internal components of the body should be accomplished with the actuator removed. To carry out this operation, follow the instructions below and refer to the specific actuator instructions (reference ER 8788 for type 87/88 actuators and ER 3000 for type 37/38 actuators).

4.1.1 Disconnect instruments

Disconnect all mechanical connections between the positioner and the other instruments. Disconnect the valve stem/actuator stem coupling as described in the following sections.

4.1.2 Plug stems screwed into the actuator stem

For air-to-retract actuators, apply sufficient air pressure to the actuator to retract the stem completely.

Caution: During this operation, make sure that the plug does not turn when it is seated. If the plug travel is very small and there is a large amount of plug stem inside the actuator, it may be necessary to remove the yoke nut and lift the actuator so that the plug is not touching the seat.

4.1.3. Stems attached with a stem connector

For air-to-retract actuators, apply sufficient air pressure on the actuator to retract the stem completely. Loosen the screws and remove the stem connector.

Caution: Prior to disassembly, vent the process pressure and isolate the valve if necessary.

4.1.4 Actuator removal

Disconnect all the air and electrical connections from and to the actuator.

Loosen the yoke nut or attachment screws and lift the actuator, making sure that the concentricity and/or the thread of the bonnet is not damaged.

4.2. Opening pressurized chamber (Figures 14 and 15)

The valve must always be reassembled with new packing sets and gaskets. Before disassembly, make sure that the appropriate parts are available.

A. Remove the packing flange nuts (3) then remove the packing flange (4) and the packing follower (23).

B. Check that the exposed part of the valve plug stem (1) is clean enough for the bonnet (7) to be removed easily.

C. Remove the body stud nuts (8).

D. Lift the bonnet (7) up and disassemble it from the valve body (18). During this operation, the valve plug stem (1) must be pushed downwards so that the valve plug remains in the valve body (18).

E. Remove the spring washer (17) or cage gasket (36) and the body gasket (10).

F. For Model 41305, 41505, 41605 and 41905 valves, remove the valve plug stem (1) and valve plug (15) assembly from the cage by pulling the valve plug stem upward. Then disassemble the cage (16) from the body (18).

Caution: Because of the piston seal ring, the cage may be lifted along with the valve plug. If this should happen, press down on the cage so that it remains in the body. If the cage is lifted along with the valve plug, it could slip during handling and become damaged.

G. In the case of a 41405 valve, remove the valve plug and body cage assembly by pulling the valve plug stem upward. In this design, the valve plug has a shoulder which prevents the cage from falling. Remove the valve plug from the cage by pushing on the end of the valve plug stem.

H. Remove the seat ring (13) and the seat ring gasket (14) from the valve body (18).

I. Remove the packing set (6), the packing spacer (5) and the guide bushing (22) from the bonnet (7).

Note: A packing spacer (5) is only required for a bonnet with a leak detector connection.

4.3. Plug stem disassembly (1)

The valve plug stem is screwed and pinned into the valve plug (15). To disassemble the stem, the valve plug must be held as shown below, taking care not to damage the guiding surfaces. Disassemble the plug stem pin (9) from the assembly. By means of flats or using a nut and counter-nut on the end of the stem, unscrew the stem from the plug taking care not to apply a bending moment which could deform it.

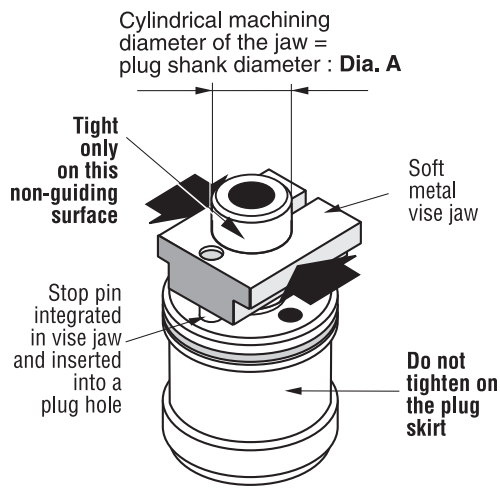

Cylindrical machining diameter of the jaw = plug shank diameter : **Dia. A**
Tight only on this non-guiding surface
Soft metal vise jaw
Stop pin integrated in vise jaw and inserted into a plug hole
Do not tighten on the plug skirt

Figure 1

4.4. Auxiliary pilot plug disassembly (Model 41405 - Figure 14)

For size 2", 3" or 4" (50, 80 or 100 mm) valves:

Exert a sufficient force on the auxiliary pilot plug (20) to compress the spring washers (12). The retaining ring (19) can then be removed, allowing for disassembly of the auxiliary pilot plug and spring washers.

For size 6" to 16" (150 to 400 mm) valves:

To carry out this operation safely, screws with diameters and lengths indicated in the table in figure 2 must be used. Thread the socket head cap screws through the holes in the auxiliary pilot plug (20). Tighten until the retaining ring (19) can be removed. Loosen the screws gradually, then remove the auxiliary pilot plug and the spring (12).

Valve Size		Pilot Dismounting Screw Sizes			
		Qty.	Length		Diameter
in.	mm		in.	mm	
6	150	2	2.25	57	1/4"- 20 UNC 2A
8	200	2	2.75	70	3/8"- 16 UNC 2A
10	250	2	2.50	63.5	
12	300	3	4.00	101.5	
16	400	3	2.50	63.5	

Figure 2

5. Maintenance - Repair

5.1. Packing box

Tight sealing within the packing box is obtained by compression of the packing (6). Compression must be achieved by evenly tightening the packing flange nuts (3) on the packing flange (4). Periodic re-tightening of the packing flange nuts is required to maintain proper sealing.

Be careful not to over tighten the packing as this could prevent proper operation of the valve. If leakage persists after maximum packing compression, then the packing needs to be changed.

A packing spacer (5) is only required for a bonnet with a leak detector connection.

5.1.1 PTFE packing

Kevlar/PTFE, carbon/PTFE and pure PTFE packing rings are cut in such a way that they can be replaced without having to separate the valve plug stem from the actuator stem.

A. Unscrew and remove the packing flange nuts (3).

B. Lift the packing flange (4) and packing follower (23) up along the valve stem.

C. By means of a puller, remove the packing (6) and packing spacer (5), being careful not to damage the sealing surface of the packing box or the valve plug stem.

D. Replace the packing rings, placing the cut in each ring about 120° apart from the adjacent ring. Press rings in one at a time in accordance with the table in Figure 3.

PTFE Packing				
Number of Rings				
Valve Size		No Leak Detector	With Leak Detector	
in.	mm		On top of packing spacer	Under packing spacer
2	50	6	2	4
3 - 4	80 - 100	8	3	5
6 - 16	150 - 500	7	2	5

Figure 3

E. Reassemble the packing follower (23) and the packing flange (4).

F. Tighten the packing flange nuts (3) without over compressing the packing rings.

G. Put the valve back into service and check for leakage. Tighten packing flange nuts (3) as required.

5.1.2 Graphite packing

To carry out this operation, the valve plug stem must be disconnected from the actuator stem. See chapter on actuator disassembly.

A. Loosen and remove packing flange nuts (3)

B. Remove packing flange (4) and packing follower (23) from the plug stem

C. Remove packing rings (6), being careful not to damage the sealing surface of the packing box or plug stem.

Graphite Packing				
Number of Rings				
Valve Size		Braided	Graphite	Braided
in.	mm			
2	50	1	4	1
3 - 4	80 - 100	1	6	1
6 - 16	150 - 500	1	4	1

Figure 4

D. Replace new packing set (6): First assemble a back-up ring (Carbon/Graphite/Inconel braided ring). Then assemble the expanded graphite rings (smooth rings) in accordance with Figure 4. Finally, assemble an additional braided back-up ring.

E. Reassemble the packing follower (23) and packing flange (4).

F. Moderately tighten the packing flange nuts (3).

G. Reassemble the valve plug stem to the actuator stem (see chapter on actuator reassembly).

H. Open and close the valve several times then tighten the packing as required.

I. Put the valve back into service and check for leakage. Tighten packing flange nuts (3) as required.

5.2. Repair of parts

Prior to reassembly, examine parts carefully for any scratches, unusual wear or other damage.

5.2.1 Guiding surfaces

Guiding surfaces of the cage, valve plug, guide bushing, plug stem, and auxiliary pilot plug must be checked. If there is only slight wear indications, then use a light abrasive to smooth out guiding surfaces. Otherwise the part must be replaced (see paragraph on spare parts).

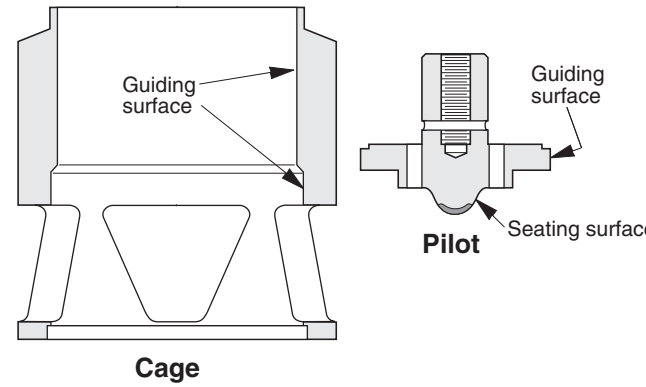


Figure 5

5.2.2 Seating surfaces (Figure 6)

If the surface of the auxiliary pilot plug (20) is damaged, the auxiliary pilot plug must be replaced (see paragraph on spare parts).

The seat ring seating surface (13), valve plug seating surfaces (15) and the auxiliary pilot plug seat (20) must be completely free of dents, wear and scratches.

Any seating surfaces showing signs of slight deterioration may be touched up on a lathe in accordance with the following guidelines.

A maximum of .010" (0.25 mm) of metal removal from seating surfaces is allowable for valve sizes 2", 3" or 4" (50, 80 or 100 mm). A maximum of .015" (0.4 mm) of metal removal from seating surfaces is allowable for valve sizes 6" to 16" (150 to 400 mm). Make sure that the seating angles indicated in Figure 6 are within tolerance.

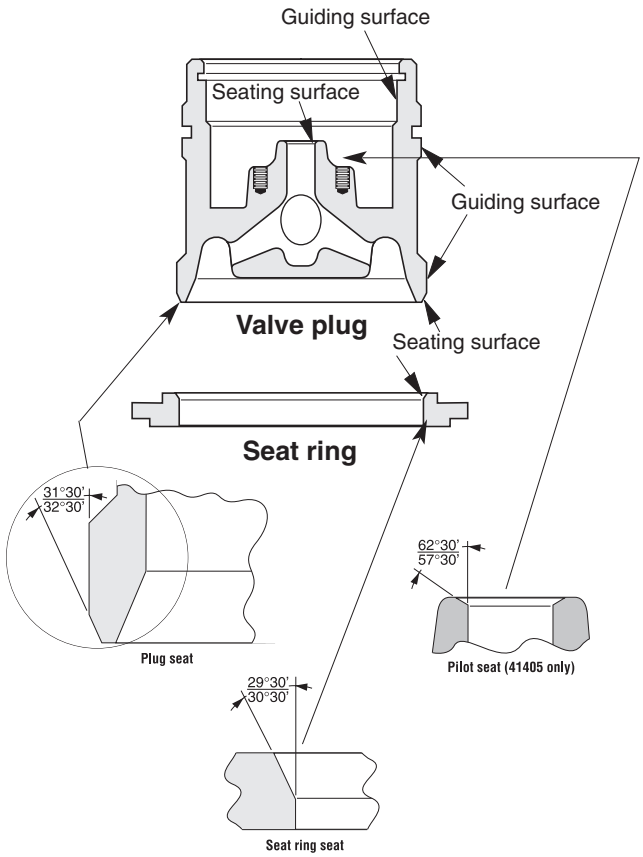


Figure 6

If a slight defect exists on any of the above seating surfaces, lapping can be applied per the following instructions:

- Place the seat ring (13) in the body (noting the seating angle).
- For Models 41305, 41505, 41605 and 41905 assemble the cage (16) onto the seat ring.
- Spread a fine layer of high quality sealing compound on the seating surface.
- For Model 41405 valves, assemble the valve plug (15), cage (16) and stem (1).
- For Models 41305, 41505, 41605 and 41905, assemble the valve plug (15) and stem (1).
- Assemble the bonnet (7) and the guide bushing (22).
- Place an appropriate tool on the valve plug stem (1) thread to allow for manual rotation.
- Lap by slightly rotating the valve plug or the auxiliary pilot plug in alternate directions. After several rotations, lift the valve stem, turn it 90°, and repeat the operation.
- Lapping can be repeated, but should be limited as much as possible so that the seat remains sufficiently narrow to guarantee tightness.
- After lapping, disassemble the parts to clean them, and then reassemble making sure that the seating angles are within tolerance.

5.2.3 Gasket seating surfaces

Gasket seating surfaces must be free of dents, scratches and corrosion.

5.2.4 Seal rings and gaskets

Spiral-wound gaskets (Items 10, 14 and 36) must always be replaced after disassembly. Piston seal rings (Items 31, 35, 40, and 45) can be reused if they are free of scratches, erosion, corrosion, or other damage.

5.2.5 Valve plug and stem

If the valve plug needs to be replaced, then the stem must also be completely changed to guarantee correct pinning of the assembly. If only the valve stem needs to be replaced, then the valve plug can be reused.

6 – Valve reassembly

6.1. Pinning the valve plug stem

The valve plug (15) and stem (1) assembly consists of a stem threaded into the valve plug and pinned in place.

If the valve plug (15) [or the auxiliary pilot plug (20) in the case of a 41405 valve] needs to be replaced, then a new stem should be used as well. Re-machining of the pin holes in the existing parts often prevents satisfactory results from being obtained, and can seriously impair the mechanical strength of the plug stem assembly.

6.1.1 Reference marking on the valve plug stem

Make a reference mark on the valve plug stem at a distance “X” (Figures 7 and 8) equivalent to the stem recess in the valve plug.

Note: This marking procedure is unnecessary for shouldered plug stems, which provide a fixed mechanical stop.

6.1.2 Screwing in the valve plug stem

To carry out this operation, the valve plug must be prevented from moving by holding the plug shank with an appropriate tool.

Screw two nuts onto the end of the new plug stem and lock them together. Screw the valve plug stem solidly into the plug, checking that the reference mark is level with the end of the plug shank.

Valve plug stem diameter B		Plug shank diameter A		Pin diameter C		Pin length F		Hole location D		Distance X		Wrench size E		Torque T			
														Non-shouldered stem		Shouldered stem	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	Ft. lbs	daN.m	Ft. lbs	daN.m
1/2	12.7	.79	20	0.14	3.5	.70	18	.91	23	.24	6	11/16	17	37	5	44	6
5/8	15.87	.98	25.5	0.2	5.0	.95	24	1.1	28	.30	8	7/8	22	118	16	118	16
3/4	19.05	1.38	35	0.2	5.0	1.2	30	1.77	45	.75	19	11/16	27	118	16	118	16
1.0	25.4	1.66	44.5	0.2	5.0	1.58	40	1.88	47.5	.98	25	11/4	30	118	16	184	25

Figure 7

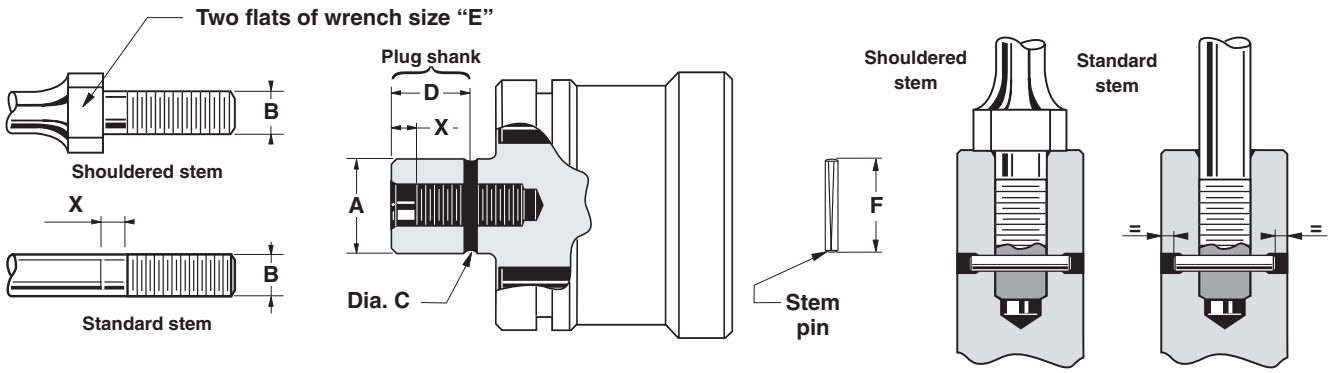


Figure 8

For shouldered stems, apply torque "T" using a wrench of dimension "E".

6.1.3 Drilling pin hole (Figures 7 and 8)

For this operation, it is recommended clamping the valve plug-stem assembly by the plug shank to avoid damaging the guiding surfaces. Particular care must be taken so that the pin hole goes through the valve plug axis.

If the valve plug is new, drill a hole of diameter "C" at a distance "D" from the end of the valve plug. Choose diameter "C" from Figure 7 according to the pin diameter used.

If the hole is already drilled in the valve plug, use the hole as a guide to drill through the valve stem.

6.1.4 Pinning

Insert the pin into the hole and press fit into the plug and stem. Make sure the pin is recessed by the same amount from both sides as shown in Figure 8.

Place the assembly in the soft jaw chuck of a lathe to check alignment of the two parts. Correct any alignment defects by tapping it lightly with a plastic or rubber mallet.

6.2. Seal ring assembly

6.2.1 Model 41305 (Figures 9A and 9B)

These valves have spring-energized seal rings which must be assembled based on the specific valve operation (see Figure 9A). To insert the ring in the valve plug groove, place it over the conical top of the plug, then push down evenly from all sides until the gasket slips into the groove (see Figure 9B).

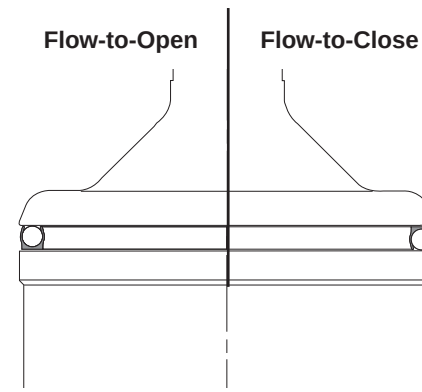
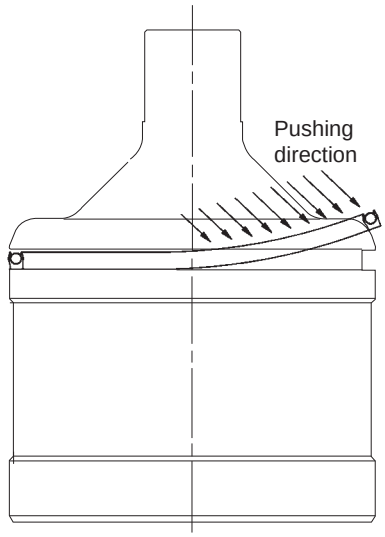


Figure 9A



Seal shown installed for FTO operation

Figure 9B

6.2.2 Models 41405 and 41505 (Figures 14 and 15)

These valves are equipped with metal seal rings. The inner ring has a straight cut while the outer ring has a staggered cut.

To insert the rings into the plug groove, open the rings slightly by hand and slide them along the plug without damaging any of the parts. Assemble the inner and outer rings separately.

Note: The cuts in the outer and inner rings should be placed approximately 180° apart.

6.2.3 Model 41605 (Figure 15)

These valves are equipped with an inner elastomeric ring and an outer PTFE ring.

Insert the elastomeric back-up ring (41) into the groove.

Place the PTFE seal ring(40) in boiling water for a few minutes. Slide the seal ring along the plug until it slips into the groove.

For optimum insertion of the ring, a Serflex type ring compressor can be used to compress the ring in the groove for several minutes.

6.2.4 Model 41905 (Figure 15)

These valves are also equipped with an inner and outer ring arrangement. The inner metal ring has a straight cut and the outer ring is made of graphite.

Replacement graphite seal rings (45) are supplied in a closed ring form, and a notch must be cut before being assembled to the plug.

Caution: Graphite seal rings are fragile so the following operations must be carried out very carefully.

Using a sharp blade, make a notch in the graphite ring. Hold the ring on either side of the notch between the thumb and index and bend until it breaks.

Using a very fine file, adjust each end of the ring so that its external circumference corresponds to the internal circumference of the inside diameter of the cage (16).

To adjust the length of the ring correctly, insert the new graphite ring into the cage with the ring against the inner wall of the cage (allowing for minimum play between the two ends of the ring).

First assemble the inner metal ring into the cage groove, then assemble the graphite ring over the metal ring. Be careful not to damage the parts.

Note: The cuts on each ring should be placed approximately 180° apart.

6.3. 41405 Valve Plug and Cage Assembly (Figure 14)

6.3.1 Valve plug and auxiliary pilot plug assembly

Assemble either the flat spring washers (sizes 2" to 4") or the coil springs (sizes 6" to 16"), then assemble the valve plug and stem assembly.

Using the same tools as those used for disassembly (see chapter on disassembly), compress the springs so that the retaining ring can be installed into the groove in the main plug.

6.3.2 Cage assembly

Assemble the cage over the valve plug assembly from the top of the plug stem. Make sure the seal ring in the plug groove stays positioned correctly.

6.4. Completing Valve Body Assembly (Figures 14 and 15)

Proceed as follows:

- After checking that the sealing surfaces are clean, assemble the seat ring gasket in the valve body. Make sure the gasket is centered properly in the body.
- Assemble the seat ring or internal diffuser seat.
- Assemble the cage (or the cage/valve plug/stem assembly in the case of 41405 valves) into the valve body.
- In the case of valves other than 41405 valves, insert the valve plug/stem/ring assembly into the cage taking particular care as it goes past the ring or spring-energized seal ring.
- For valve sizes less than (2" to 4"), assemble the body/cage gasket into the valve body. Make sure it is centered as well as possible.

TORQUE Body/Bonnet Bolting Requirements					
VALVE SIZE		**Body Nuts**		**Assembly Torque**	
Nominal size (in)	**Pressure rating**	**Size (in)**	**Quantity**	**ft.lb**	**N.m**
2	150/300	3/4 10	6	104	140
	600	3/4 10	6	163	220
	900	7/8 9	8	156	210
	1500	7/8 9	8	222	300
3	150/300	3/4 10	8	133	180
	600	3/4 10	8	163	220
	900	1 1/4 8	6	563	760
	1500	1 1/4 8	6	815	1100
4	150/300	7/8 9	8	170	230
	600	7/8 9	8	259	350
	900	1 1/2 8	6	889	1200
	1500	1 1/2 8	6	1370	1850
6	150/300	1 8	8	326	440
	600	1 8	12	237	320
	900	1 3/4 8	8	1370	1850
	1500	1 3/4 8	8	1370	1850
8	150/300	1 1/4 8	8	526	710
	600	1 1/4 8	12	481	650
	900	1 3/4 8	8	1370	1850
	1500	1 3/4 8	8	1778	2400
10	150/300	1 1/2 8	8	852	1150
	600	1 1/2 8	12	852	1150
	900	1 3/4 8	12	1370	1850
	1500	1 3/4 8	12	1630	2200
12	150/300	1 1/2 8	8	926	1250
	600	1 1/2 8	12	852	1150
	900	1 1/2 8	16	926	1250
	1500	1 3/4 8	16	1630	2200
16	150/300	1 1/2 8	12	852	1150
	600	1 1/2 8	16	826	1250
	900	1 1/2 8	20	1111	1500
	1500	1 3/4 8	20	1926	2600

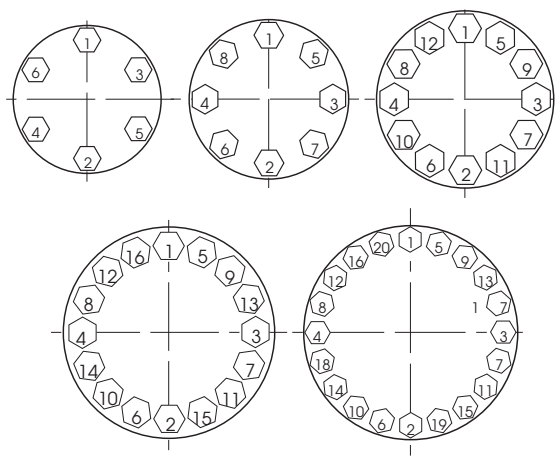


Figure 10

- For valve sizes 6" to 16", assemble either the cage gasket (36) or the conical spring washer (17) with the concave side upwards (depending on the type of valve). Then place the body gasket into the valve body making sure that it is centered properly.

6.5. Bonnet Assembly

Make sure the packing (6), packing spacer (5) and guide bushing (22) have been removed from the bonnet.

Position the bonnet (7) above the valve body, so that the packing flange studs (2) are perpendicular to the flow direction of the valve.

Assemble the bonnet (7) over the valve stem (1) and push it down carefully until it is positioned correctly over the valve body studs (21).

Grease the threads of the valve body studs (21) and the bearing surfaces of the body stud nuts (8).

Assemble the body stud nuts by hand. Hand tighten the nuts evenly so that the internal parts are held in place. The face of the bonnet should be parallel to the upper face of the body.

Slide the guide bushing (22) onto the valve plug stem and let it drop to the bottom of the packing box.

6.6. Tightening Body Stud Nuts

6.6.1. Alignment of internal parts

In order to achieve perfect alignment of the body and the internal components, the plug stem should be loaded during tightening of the body nuts to obtain correct positioning of the various parts.

The force can be applied with the pneumatic actuator as follows:

Place the actuator on the valve bonnet (7) by means of the yoke nut (33) or attachment screws and connect the valve plug stem to the actuator stem. See chapter on actuators for installation instructions.

Caution: During this operation, make sure that the plug does not turn when it is seated. If the plug travel is very small and there is a large amount of plug stem inside the actuator, it may be necessary to remove the yoke nut and lift the actuator so that the plug is not touching the seat.

Align the internal parts as follows:

For air-to-extend actuators, supply air to the actuator at the maximum pressure indicated on the serial plate. In the case of spring-to-extend actuators, do not supply air to the actuator, so that the optimum positioning of the valve plug and seat can be obtained.

Tighten the body nuts (8) evenly by applying the torque and tightening sequence indicated in the table in Figure 10.

6.7. Packing Box Assembly

Assemble the packing box components per the maintenance instructions in paragraphs 5.1.1 or 5.1.2.

7. Actuator

7.1. Connecting Type 88 No. 6 Actuator (Figure 17)

A. Tightly assemble the 2 hex nuts (1) onto the plug stem.

B. Push down the actuator, and screw on the yoke nut (33) at the same time. Then assemble the bottom stem connector (2). As soon as it becomes possible, insert the valve stem into the actuator stem. The stem must be inserted far enough so that when there is no air in the actuator, the valve plug does not touch the seat.

C. Tighten the yoke nut.

D. Unscrew the valve plug stem until the valve plug comes into contact with the seat. Do not turn the valve plug on the seat as this could damage the sealing surfaces.

E. Supply air to the actuator until the stem has travelled at least .40 inches (10 mm).

F. Unscrew the plug stem by the number of turns N1 specified in Figure 11.

CAUTION: For Model 41405 valves, use the N2 valves in Figure 11 to insure seating tightness of the pilot plug.

G. Screw the 2 nuts (1) as far as they will go and check that operation is correct.

H. Use the pointer (7) to set the travel scale (9) to the valve closed position.

7.2. Connecting Type 87 No. 6 Actuator (Figure 17)

A. Tightly assemble the 2 hex nuts (1) onto the plug stem.

B. Push down the actuator, and screw on the yoke nut (33) at the same time. Then assemble the bottom stem connector (2). As soon as it becomes possible, insert the valve stem into the actuator stem. The stem must be inserted far enough so that when there is no air in the actuator, the valve plug does not touch the seat.

C. Tighten the yoke nut.

D. Supply air to the actuator at the final pressure.

E. Use the pointer (7) to set the travel scale (9) to the valve open position.

F. Supply the actuator with air at a sufficiently high pressure to obtain a travel equal to the nominal travel of the valve less dimension A in Figure 12.

G. Unscrew the plug stem until the valve plug is in contact with the seat. Do not turn the valve plug on the seat as this could damage the sealing surfaces.

H. Screw the 2 nuts (1) as far as they will go and check that operation is correct.

7.3. Connecting Type 87 No. 10, 16 and 23 Actuators (Figure 17)

A. Tightly assemble hex nut (1) onto the plug stem.

B. Screw the top stem connector assembly tightly onto the actuator stem.

C. Push down the actuator, and screw on the yoke nut (33) at the same time. Then assemble the bottom stem connector assembly by screwing until it comes into contact with the hex nut (1).

D. Push down the actuator and tighten the yoke nut.

E. Supply the actuator with air at the initial pressure indicated on the spring scale.

F. Position the stem connector assembly at distance “X” indicated in Figure 13.

G. Use the pointer (7) to set the travel scale (9) to the valve open position.

H. Supply the actuator with air at a high enough pressure to obtain a travel equal to the nominal travel of the valve

CAUTION: For Model 41405 valves, reduce the travel by value A indicated in Figure 12.

I. With the plug correctly positioned on the seat, unscrew the bottom stem connector assembly until it comes into contact with the top stem connector. Tighten the socket head cap screws (5), hex nut (1) and lock nut (32) and check that the operation is correct.

Plug Stem Diameter	N1 (turn)	N2 41405 (turn)	a	
			in	mm
1"	1.25	4.75	0.09	2.3
3/4"	1.25	4.25	0.08	2.0
5/8"	1.5	3.5	0.08	2.0
1/2"	1.5	3	0.075	1.9

Figure 11: Reverse Actuators - valve seating

7.4. Connecting Type 88 No. 10, 16 and 23 Actuator (Figure 17)

A. Tightly assembly hex nut (1) onto the plug stem.

B. Tightly screw the top stem connector assembly onto the actuator stem.

C. Push down the actuator, and screw on the yoke nut (33) at the same time. Then assemble the bottom stem connector assembly by screwing until it comes into contact with the hex nut (1).

D. Push down the actuator and tighten the yoke nut.

E. Unscrew the top stem connector in accordance with dimension "X" in Figure 13.

F. With the plug correctly positioned on the seat, unscrew the bottom stem connector assembly to bring it into contact with the top stem connector.

G. Supply air to the actuator until the stem has travelled at least 0.40 inches (10 mm).

H. Unscrew the top stem connector by the number of turns N1 specified in Figure 11 then lock manually with hex nut (1). CAUTION: For 41405 valves, use the N2 values to insure seating tightness of the pilot plug.

I. Release the pressure in the actuator. Use pointer (7) to set the travel scale (9) to the actuator supply pressure so that the two stem connectors come into contact. Then tighten the socket head cap screws (5), hex nut (1), and lock nut (32).

J. Shut off the closed valve pressure and check that operation is correct.

Valve Size (inches)	Pressure Rating	Value A	
		in	mm
2	150, 300 or 600	0.1	2.5
2	900 or 1500	0.08	2
3 & 4	150, 300 or 600 900 or 1500	0.12	3
6		0.2	5
8		0.24	6
10, 12 & 16		0.275	7

Figure 12: Pilot plug travel

7.5. Connecting Type 37 Actuator (Figure 16)

A. Push down on the plug stem (1) until the plug is seated.

B. Attach the actuator to the valve bonnet with the yoke nut (33) or attachment screws. Apply a sufficient pressure to the diaphragm to extend the actuator stem by the normal valve travel for valves 41305, 41505, 41605 and 41905 and the travel minus the value of A in Figure 12 for 41405 valves.

Actuator Size	Travel		" X " Actuator 87		" X " Actuator 88	
	in	mm	in	mm	in	mm
10	0.8	20	5.12	130	4.62	117.3
10	1.5	38	5.44	138.2		
16	0.8	20	8.00	203.2	7.02	178.3
16	1.5	38	8.50	228.6		
16	2.0	51	9.28	235.7		
16	2.5	63.5	9.50	241.3		
23	0.8	20	8.25	209.5		
23	1.5	38	8.62	218.9		
23	2.0	51	9.12	231.6		
23	2.5	63.5	9.59	243.6		

Figure 13: Position of top stem connector

C. Assemble the two parts of the stem connector (51) and the travel indicator (58). The number of threads inside the stem connection must be approximately equal for each stem. Tighten screw(s) (52).

D. Check that the travel of the actuator stem corresponds to the normal travel of the valve, and that the closed position is obtained for the maximum spring range indicated on the serial plate.

E. Shut off the air pressure. Use the pointer (58) to set the travel scale (56). The pointer (58) must indicate "open" when the air pressure is off.

7.6. Connecting Type 38 Actuator (Figure 16)

A. Connect a temporary air supply line to the actuator. Apply sufficient pressure to the diaphragm to retract the actuator stem completely. Attach the actuator to the valve bonnet with the yoke nut (33) or attachment screws.

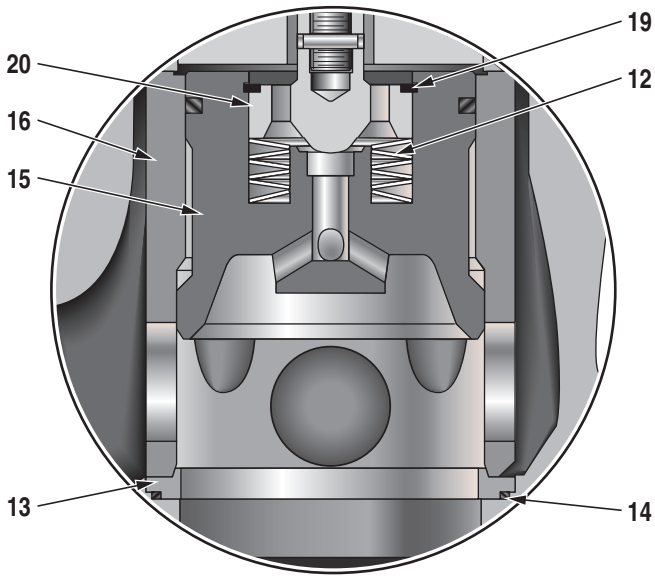
B. Shut off the air pressure completely. Increase the air pressure to retract the actuator stem by the value of a in Figure 11.

C. Assemble the two stem connectors (51) and the pointer (58). The number of threads inside the stem connection must be approximately equal for each stem. Tighten screw(s) (52).

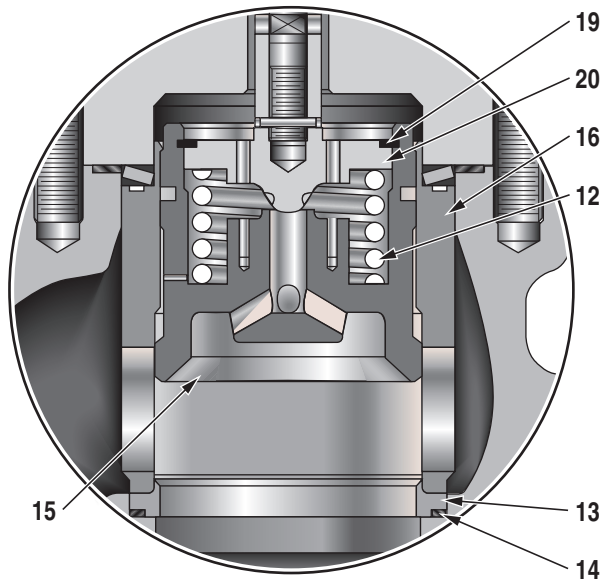
D. Check that the travel of the actuator stem corresponds to the effective travel of the valve, and that the closed position is obtained for the minimum spring range indicated on the serial plate.

E. Shut off the air pressure. Use the pointer (58) to set the travel scale (56). The pointer (58) must indicate "closed" when the air pressure is off.

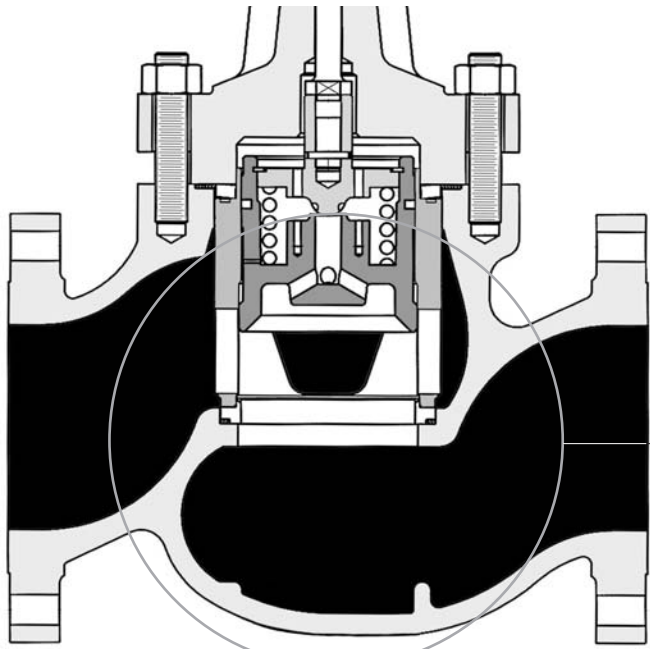
Figure 14 - 41405 Internal Parts



Pilot Trim for Valve Sizes
2" to 4"



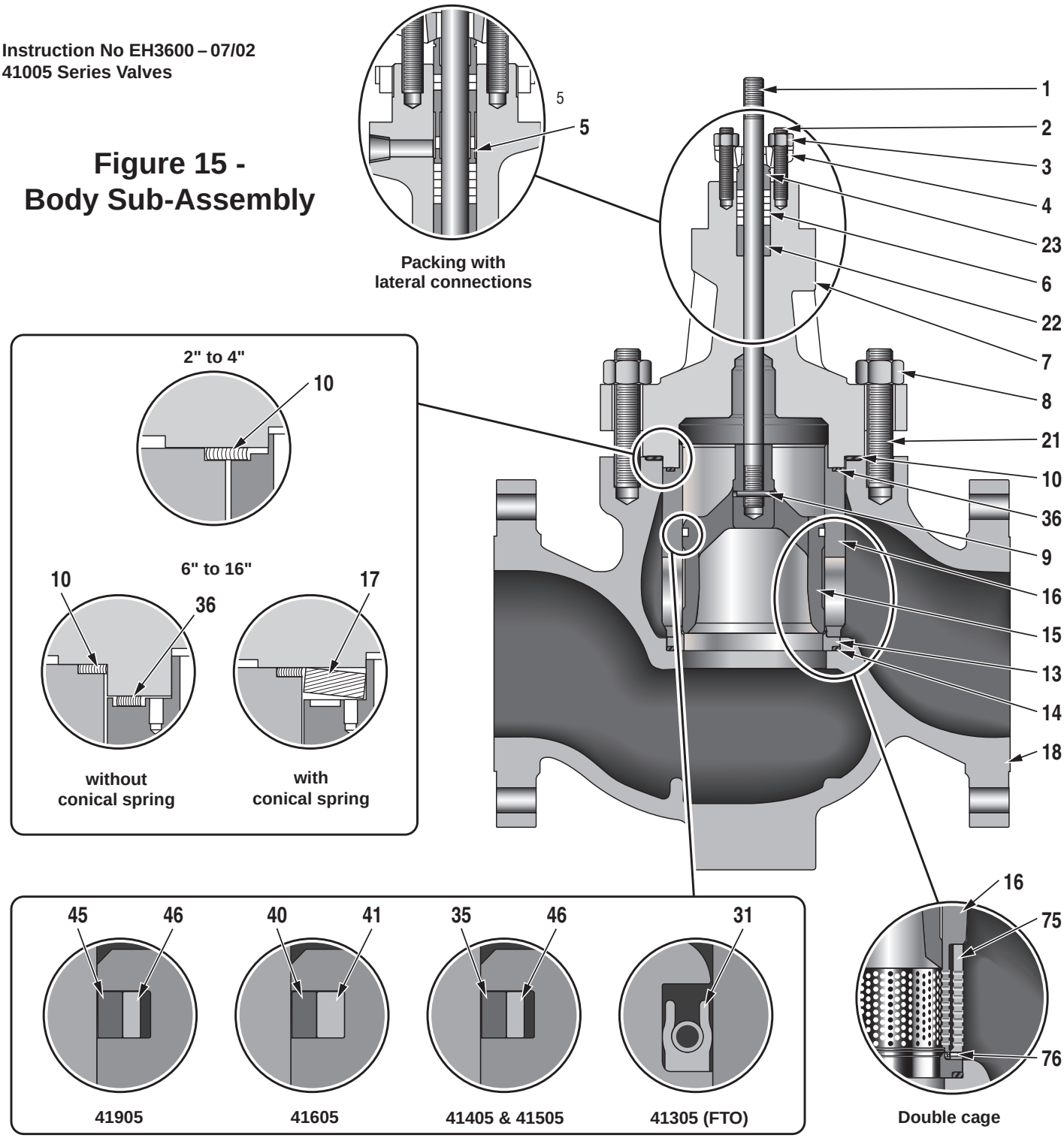
Pilot Trim for Valve Sizes
6" to 16"



6" to 16"

Internal Diffuser Option
for Valve Sizes
6" to 16"

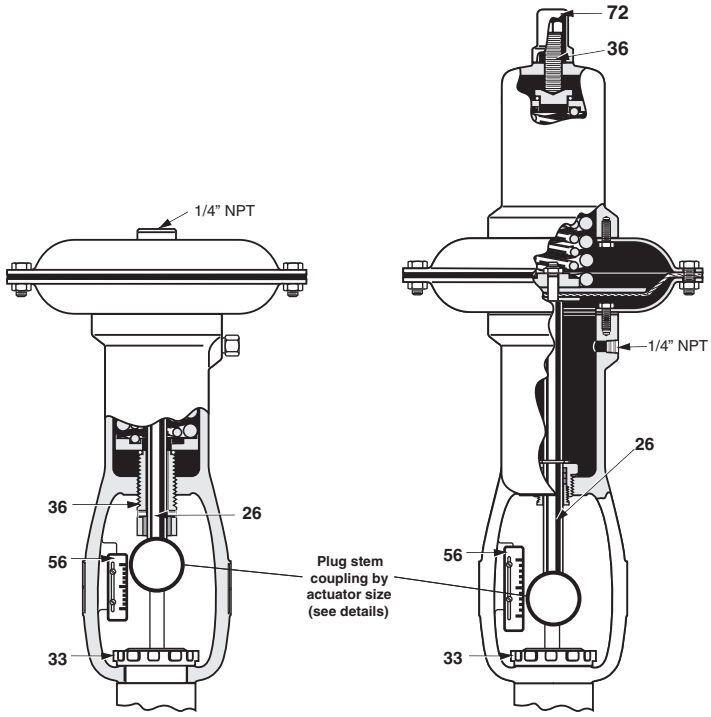
Figure 15 - Body Sub-Assembly



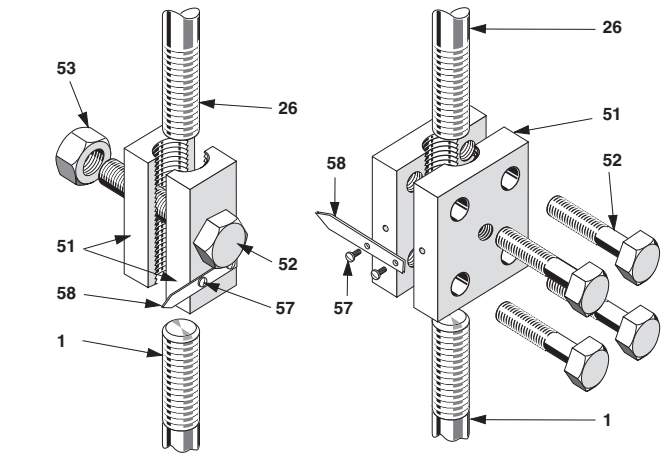
PARTS REFERENCE

Ref. No.	Description	Ref. No.	Description	Ref. No.	Description	Ref. No.	Description
1	Valve Plug Stem	● 9	Plug Stem Pin	18	Valve Body	36	Cage Gasket
2	Packing Flange Stud	●10	Body Gasket	⁎19	Retaining Ring	★ ●40	PTFE Seal Ring
3	Packing Flange Nut	⁎12	Pilot Spring(s)	⁎20	Auxiliary Pilot Plug	★ ●41	Nordel ® Backup Ring
4	Packing Flange	13	Seat Ring	21	Valve Body Stud	❑ ●45	Graphite Seal Ring
5	Packing Spacer	●14	Seat Ring Gasket	22	Guide Bushing	❑ ●46	Ni-resist ® Backup Ring
● 6	Packing	15	Valve Plug (or Piston)	23	Packing Follower	▲50	Washer (Body nuts)
7	Bonnet	16	Cage	● 31	Tec Seal	75	Double cage
8	Valve Body Nut	✢17	Conical Spring	❍ ●35	Ni-resist ® Seal Ring	76	Pin

⁎ On 41405 Series Valves Only
✢ On 6" to 16" Valves Sizes Only (150 to 400 mm)
★ On 41605 Series Valves Only
● Recommended Spare Parts
❑ On 41905 Series Valves Only
❍ On 41405/505 Series Valves Only



Type 37 Type 38

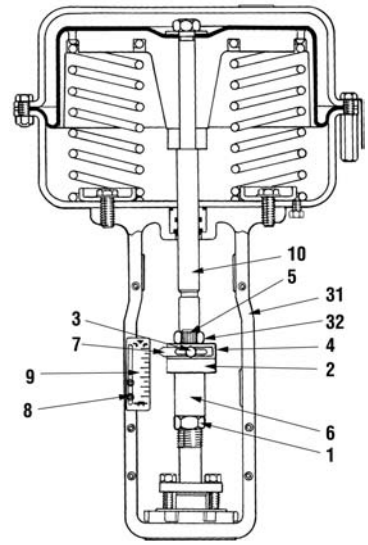


Coupling parts (No.18 & 18 L actuators) Coupling parts (No. 24 actuators)

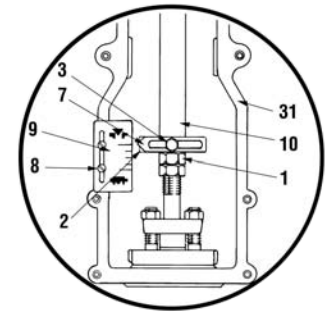
PARTS REFERENCE

Ref. No.	Description	Ref. No.	Description
1	Valve Plug Stem	53	Coupling Nut
26	Actuator Stem	56	Travel Indicator Scale
33	Drive Nut	57	Machine Screw
36	Spring Adjuster	58	Travel Indicator
51	Coupling		
52	Coupling Screw	72	Spring Barrel Cap

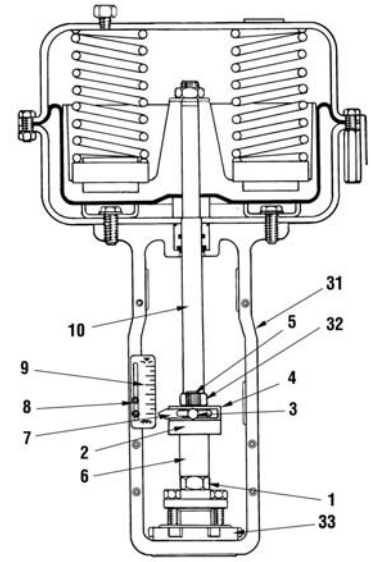
Figure 16
SPRING AND DIAPHRAGM ACTUATOR
Type 37/38



Type 87
No. 10-16-23



Type 87
No. 6



Type 88
No. 10-16-23

PARTS REFERENCE

Ref. No.	Description	Ref. No.	Description
1	Hex Nut	8	Screw, Pan head
2	Stem Connector, bottom	9	Scale - Travel
3	Cap Screw, Hex head	10	Actuator stem
★ 4	Stem Connector, top	31	Yoke, machining
★ 5	Cap Screw, socket head	★32	Lock Nut
★ 6	Connector Insert	33	Drive Nut
7	Pointer		

★ Not provided for Size 6 Actuator

Figure 17
SPRING DIAPHRAGM ACTUATORS
Type 87/88 Multispring

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BELGIUM
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Fax: +32-2-344-1123

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Fax: 55-11-2146-3610

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